AFFIDAVIT OF MARK STORK GEORGE, M.D

STATE OF SOUTH CAROLINA

COUNTY OF CHARLESTON

I, MARK S. GEORGE, after being duly sworn, do state as follows:

1. My name is Mark Stork George. I am the Director of the Brain Stimulation Laboratory at Medical University of South Carolina (MUSC) in Charleston, South Carolina, Director of the Specialty Division, MUSC Psychiatry Department, University Distinguished Professor, Departments of Psychiatry, Radiology and Neurology at MUSC, Adjunct Professor of Psychology, College of Liberal Arts at the University of South Carolina, Statewide Co-director and MUSC Director, SC Statewide Brain Imaging Center of Excellence (BICOEE) and Staff Psychiatrist and Director, Psychiatric Neuroimaging, Ralph H. Johnson VA Medical Center, Charleston, SC.

2. I am board certified by the American board of Psychiatry and Neurology for Neurology and Psychiatry.

3. I have extensive experience in these fields and, particularly, the developing technologies in these fields as their usage expands.

4. I have developed and used the technology of functional imaging to discover that specific brain regions change activity during normal emotion.

5. In 1995, I built the functional neuroimaging division and brain stimulation laboratories at MUSC, which has grown into the MUSC Center for Advance Imaging Research, now part of the SC Brain Imaging Center of Excellence.

6. I pioneered treatments for resistant depression, which were FDA approved in 2008, and used MRI imaging to understand some of the effects.

7. I am a world expert in brain stimulation, depression, and am the editor-in-chief of a new journal I have launched with Elsevier in 2008, *Brain Stimulation: Basic, Translation and Clinical Research in Neuromodulation.*

8. I sit on several editorial review boards and NIH study sections, have published over 300 scientific articles or book chapters, have eight patents, and have written or edited 6 books. Further details of my work can be found in my current curriculum vitae, hereto attached as Exhibit A.

9. I developed the underlying methods and procedures used in fMRI testing for truth verification. These methods have now been widely adopted by the neuroscience community, including using this technology for disease prediction.

10. I have volunteered to submit this affidavit without cost. I am financially independent of Cephos Corp. and will not gain monetarily by the development of fMRI technology for truth verification. I volunteered to submit this affidavit because I believe that fMRI technology for truth verification is a credible, reliable and valuable scientific contribution.

MUSC holds a portion of the Cephos patent portfolio. As an MUSC investigator on this patent, I would get 50% of the MUSC royalty, which is only nominal to begin with.

11. As part of my expertise, I am intricately familiar with the field of fMRI testing and analysis. I base all of the following opinions and observations on my education, experience, knowledge, specialized skill and expertise.

12. I have conducted tests, reviewed data, and analyzed the research to produce a conclusion that fMRI testing for purposes of truth detection is reliable, repeatable, testable, the error rates are quantifiable, and the technology has been peer reviewed and published.

13. It is my opinion that the general principles and theories of fMRI testing for purposes of truth detection are reliable and valid, and that the testing produces reliable and repeatable results.

14. It is my opinion that the theory, method and procedures underlying the findings in fMRI testing for truth verification are scientifically sound, have been confirmed in controlled laboratory setting and are credible.

15. It is my opinion that the methodology fMRI testing for truth detection has been tested and is capable of being retested.

16. The fMRI technology is capable of being tested because the procedure is repeatable and the results can be validated, at least in the clinical setting. Any number of subjects can be submitted to precisely the same technology, and results analyzed by a single computer algorithm.

17. The fMRI questions are presented to the subject on a computer screen and not by a human interviewer, in random order. They are then interpreted by a computer algorithm without human interpretation of the results. For quality control

purposes, the results are then checked by a qualified, educated, and trained specialist.

18. Since the results are interpreted by a computer, the fMRI is not susceptible to confirmation bias. The computer programs used in fMRI testing for truth verification are well-tested. A well-tested computer program will interpret results more reliably than a single human practitioner.

19. The fMRI testing for purposes of truth detection measures which brain regions the subject uses to answer a question. This highly scientific process of identification has been rigorously tested time and time again, independent of any type of litigation, strictly within the constructs of science.

20. The fMRI testing for truth verification has been subjected to peer review and publication, published in scholarly journals in more than twenty instances, with a dramatic increase in publication since 2006 as the technology continues to evolve, improve, and be reviewed.

21. The science that underlies fMRI testing for truth verification has been subjected to rigorous peer-evaluation by the larger scientific community, which occurs post-publication and is ongoing.

22. Multiple fMRI studies have produced quantifiable error rates for determining whether a subject was telling the truth or lying. The computerization component of fMRI testing allows standardization to occur, including the presentation of questions, the speed at which they are administered, and the timing of the fMRI

imaging which can all be consistently administered, monitored, and analyzed by computer.

23. This fMRI technology is used extensively at the highest levels of various medical research fields, and like DNA evidence, has multiple aspects of application and use. Similarly, like the extensive publications on DNA matching, and the procedures underlying DNA matching, fMRI testing for truth verification has been exposed to the public through submission of underlying data and fMRI testing for truth verification results have been published and critiqued in peer-reviewed articles.

Further, your Affiant saith not.

DATED this 22 day of March, 2010.

MARK S. GEORGE, M.D.

SWORN TO AND SUBSCRIBED BEFORE ME this 22 day of March, 2010.

NOTARY PUBLIC

My Commission Expires:

July 14, 2015

Curriculum Vitae

MARK STORK GEORGE, M.D.

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MUSC, IOP, 67 President Street
Charleston, SC 29425-0720
Telephone: (843) 876-5142
FAX: (843) 792-5702
E-mail: georgem@musc.edu

DATE AND PLACE OF BIRTH: March 17, 1958, Columbia, South Carolina

PROFESSIONAL LICENSURE:

Diplomate, Neurology, (Board Certification #36575), American Board of Psychiatry and Neurology (November, 1992).

Diplomate, Psychiatry, (Board Certification #38811), American Board of Psychiatry and Neurology (January, 1994).

South Carolina State Board of Medical Examiners #13093

Limited License, General Medical Council, United Kingdom, (1990-1991)

MARITAL/FAMILY STATUS:

Married to Dr. Eloise D. Bradham, anesthesiologist, 5/24/86
Daughter, Laura Jane George, born 4/30/94
Son, Daniel Robert George, born 6/03/97

EDUCATION:

1980	**A.B.** (1980) (Philosophy, cum laude), Davidson College, Davidson, NC
1980 - 1981	South Carolina College (The Honors College), University of South Carolina, Columbia, S.C. (Pre-medical courses in biology, physics, chemistry)
1985	**M.D.** (1985) Medical University of South Carolina (MUSC), Charleston, SC

Last Modified January 22, 2010

Text Summary of Career:

As an undergraduate student in philosophy at Davidson College in Davidson, NC, Dr. George first began studying the relationship between mind and brain, or brain/behavior relationships. He has continued this interest throughout his career with a focus on using brain imaging and brain stimulation to understand depression and devise new treatments.

He received his medical degree from the Medical University of South Carolina in Charleston in 1985, where he continued with dual residencies in both neurology and psychiatry. He is board certified in both areas. Following his residency training he worked for one year (1990-91) as a Visiting Research Fellow in the Raymond Way Neuropsychiatry Research Group at the Institute of Neurology, Queen Square, London, England. During his fellowship he wrote one of the first textbooks in the new area of brain activation and imaging.

He then moved to Washington, DC, working with Dr. Robert Post in the Biological Psychiatry Branch of the Intramural National Institute of Mental Health (NIMH). During his 4 years at NIMH he was one of the first to use functional imaging (particularly oxygen PET) and discovered that specific brain regions change activity during normal emotions. He then started using imaging to understand brain changes that occur in depression and mania, a quest that he and many others are still pursuing. This imaging work directly led to his pioneering use of a non-invasive brain stimulation method, transcranial magnetic stimulation (TMS), as a probe of neuronal circuits regulating mood, and to clinical trials using TMS as an antidepressant. In 1993 while at the NIMH, he discovered that daily prefrontal rTMS over several weeks could treat depression and ever since he has worked to grow the science of TMS, both in terms of how it works in the brain, and in critically evaluating its therapeutic applications, especially in the area of treating depression. This was FDA approved in October, 2008. He has completed the pivotal study in this area with NIH funding and is now investigating its effectiveness in the VA population through a VA cooperative study.

In 1995 he moved back to Charleston and built the functional neuroimaging division and brain stimulation laboratories. This imaging group has grown into the MUSC Center for Advanced Imaging Research, which is now part of the SC Brain Imaging Center of Excellence. He continues to use imaging (particularly functional MRI) and non-invasive stimulation (TMS, or VNS), either separately or more recently in combination, to understand the brain regions involved in regulating emotion in health and disease. In June 1998 at MUSC, he also helped pioneer another new treatment for resistant depression, vagus nerve stimulation (VNS). This was FDA approved in 2006. He and his group have used MRI imaging to understand VNS brain effects.

He is a world expert in brain stimulation, and depression, and is the editor-in-chief of a new journal he launched with Elsevier in 2008 called, *Brain Stimulation: Basic, Translation and Clinical Research in Neuromodulation*. He has been continuously funded by NIH and other funding agencies since his fellowships. He has received both a NARSAD Young Investigator and Independent Investigator Award to pursue TMS research in depression. He has received numerous international awards including the NARSAD Klerman Award (2000), NARSAD Falcone Award (2008) and the Lifetime Achievement Award (2007) given by the World Federation of Societies of Biological Psychiatry (WFSBP). In 2009 *US News and World Report* named him one of 14 'medical pioneers who are not holding back'. He is on several editorial review boards and NIH study sections, has published over 300 scientific articles or book chapters, has 8 patents, and has written or edited 6 books.

PROFESSIONAL EXPERIENCE:

2000 - present	University Distinguished Professor (Awarded by MUSC Board of Trustees, 9/01), Departments of Psychiatry, Radiology and Neurology, Medical University of South Carolina (MUSC) (With tenure, 1997).
2000 – present	Director, Specialty Division, MUSC Psychiatry Department
1996 - present	Director, Brain Stimulation Laboratory, MUSC
2002- present	Adjunct Professor of Psychology, College of Liberal Arts, University of South Carolina
2003- present	Statewide Co-director and MUSC Director, SC Statewide Brain Imaging Center of Excellence (BICOEE)
1996 – 2004, 2009-present	Staff Psychiatrist and Director, Psychiatric Neuroimaging, Ralph H. Johnson VA Medical Center, Charleston
2000 - 2008	Director, MUSC Center for Advanced Imaging Research (CAIR)
1999 - 2000	Professor, Departments of Psychiatry, Radiology and Neurology, MUSC
1995 - 2000	Director, Functional Neuroimaging Research Division, Psychiatry Department, MUSC.
1995 - 1998	Associate Professor, Departments of Psychiatry, Radiology and Neurology, MUSC
1995 - 1997	Adjunct Professor/ Visiting Scientist, Biological Psychiatry Branch, NIMH.
1991 - 1995	Senior Staff Fellow, Biological Psychiatry Branch, National Institute of Mental Health, Bethesda, MD
1990 - 1991	Visiting Research Fellow, Raymond Way Neuropsychiatry Research Group, Institute of Neurology, Queen Square, London, England
1990 - 1991	Senior Registrar (Honorary), The National Hospital for Neurology and Neurosurgery, Queen Square, London
1990 - 1991	Trainee, Institute of Nuclear Medicine, University College of London and Middlesex School of Medicine, London
1989 - 1991	Clinical Instructor, Neurology and Psychiatry, MUSC
1989 - 1990	Chief Resident, Neurology, MUSC
1986 - 1990	Resident, Combined Neurology and Psychiatry Program, MUSC
1985 - 1986	Intern (Medicine, Neurology and Psychiatry), MUSC

SUPPLEMENTAL TRAINING:

Advanced Cardiac Life Support - approved, Charleston, S.C., September, 1989.
Nuclear Medicine 'Core of Knowledge' - Royal College of Nuclear Medicine, Course Given at the Royal Free Hospital, London, October, 1990.
Statistics 500M - Statistics for Biomedical Scientists, Fall, 1991, Foundation for Advanced Education in the Sciences, Inc.(FAES), NIH Biochemistry 533M - The Molecular and Cellular Basis of Intercellular Communication, Fall, 1992, FAES, NIH
Computers 319 - Introduction to UNIX, Fall, 1992, FAES, NIH

OTHER WORK EXPERIENCE:

1982 - 1983	(Summers) Salmon Fisherman based in Kodiak, Alaska
1980 - 1981	Graduate Assistant, USC Philosophy Department
1976 - 1979	Staff Writer for *The Davidson Update*, Davidson NC
1977 - 1979	(Summers) Staff Writer for *The State* Newspaper, Columbia SC
1976	(Summer) Runway Striper, The S.C. Aeronautics Commission

MEMBERSHIPS, PROFESSIONAL ORGANIZATIONS:
(p= past)

Alpha Omega Alpha (elected 3/00)
Academy of Psychosomatic Medicine (p), American Academy of Neurology (p)
American Association for the Advancement of Science
American Association for the Study of Headache (p)
American College of Neuropsychopharmacology (ACNP) (Full Member, 1999)
American Medical Association,
American Neuropsychiatric Association (p)
American Psychiatric Association (Distinguished Fellow, 2008)
Association for Academic Psychiatry (p),
Association for Convulsive Therapy (ACT),
Behavioral Neurology Society (p), British Neuropsychiatry Association (visiting)
Charleston County Medical Society,
Collegium Internationale Neuro-psychopharmacologicum (CINP),
International Society for Affective Disorders (ISAD),
International Society for the History of Neurosciences (p)
International Society for Neuroimaging in Psychiatry,
International Society for Transcranial Stimulation (ISTS),
Society of Biological Psychiatry
Society for Neuroscience,
South Carolina Medical Society
South Carolina Psychiatric Association,
Southern Association for Research in Psychiatry (p)
World Federation of Societies of Biological Psychiatry

SCIENTIFIC, EDITORIAL AND MEDICAL ADVISORY BOARDS:

Member, American Psychiatric Association, Council on Research,
Committee on Research Training (1994-2001).
Member, American Psychiatric Association, Council on Research, Committee on ECT and other Electromagnetic Brain Treatments (2001- present).
Chairperson, The rTMS Depression Consortium (6/96 - present)
The International Autistic Research Organisation (U.K.)(1991 - present).
Co-Chair, WFSBP Task Force on Brain Stimulation Treatments (2006-present).

Editor, North America, Human Psychopharmacology: Clinical and Experimental (1995 - 1999).
Editor in Chief – Brain Stimulation: Basic, Translational and Clinical Research in Neuromodulation (Elsevier, launched 2008)

Guest Editor:
Psychiatric Annals, 1994: 24,12
'The Emerging Neuroanatomy of Depression'
CNS Spectrums 1997:2
'Transcranial Magnetic Stimulation - A Neuropsychiatric Tool for the 21st Century'
Primary Psychiatry 1998: 5
"Advances in Brain Imaging: What the Primary Psychiatrist Needs to Know"
Epilepsy and Behavior, 2001
"Neurostimulation and Neuropsychiatric Disorders"
Journal of ECT, 2002
"Advances in Brain Stimulation"

Editorial Board:
Biological Psychiatry (p)
Current Review of Mood Disorders
CNS Spectrums: The International Journal of Neuropsychiatric Medicine

Depression and Anxiety
Neuroscience Imaging

Industry Advisory Boards:

Cyberonics Depression Scientific Advisory Board (6/01 - 6/08)
Cyberonics Neuroscience Advisory Board (11/01 – 6/08)
Neuronetics Depression Advisory Board (9/01 – present)
Depression Clinical Trial Steering Committee Member, Neuronetics (2003-present)
DSMB member – ASPECT Medical Pivotal Trial (2006-present)
Neuropace – Scientific Advisory Board
Cephos – Unpaid Consultant

REVIEWER, JOURNALS:

American Journal of Psychiatry; Anxiety and Depression; Archives of General Psychiatry; Brain; Biological Psychiatry; Bipolar Disorders: An International Journal of Psychiatry and Neurosciences; Canadian Review of Neuroscience; Cerebral Cortex; Cognitive and Behavioral Neurology; Convulsive Therapy; Cortex; Depression and Anxiety; Human Brain Mapping; Human Psychopharmacology: Clinical and Experimental; International Journal of Neuropsychopharmacology; Clinical Neurophysiology; Journal of Abnormal Psychology; Journal of Affective Disorders; Journal of Nervous and Mental Disease; Journal of Neuroimaging; Journal of Neuropsychiatry and Clinical Neurosciences; Journal of the American Medical Association (JAMA); Journal of ECT; Journal of Theoretical Biology; Neuroimage; Neurology; Neuropsychopharmacology; Neuropsychiatry, Neuropsychology and Behavioral Neurology; NeuroReport; Neuroscience; Neuroscience Methods; Pediatrics; Psychiatry Research; Psychological Medicine; Psychosomatics; Radiology; Science; Schizophrenia Research; The European Journal of Neuroscience; Trends in Cognitive Neuroscience.

REVIEWER, GRANTS:

Ad Hoc Reviewer: The Ontario Mental Health Foundation, VA Merit Reviews, National Institute on Drug Abuse, National Institute of Mental Health, NINDS, National Science Foundation, Human Frontiers in Science Program, Canada Medical Research Council, UK MRC.

Currently on NIH Neurotechnology Study Section.

REVIEWER, COLLEGES AND TRAINING PROGRAMS:

December, 2003 – Triennial External Peer Review – School of Behavioral and Cognitive Neurosciences, University of Groningen, Holland.

PUBLICATIONS

Quick Summary 1/21/2010
304 articles or letters found in Scopus, 5591 citations,
H-index 50 (50 articles have been cited at least 50 times)

Letters:

1. **George MS**: Neuroscience and Psychiatry. Am J Psychiatry 1987; 144(8):1103.
2. **George MS**, Melvin JA, Mossman D: Mental illness and creativity. Am J Psychiatry 1988; 145(8):908.
3. Lydiard RB, **George MS**: Fluoxetine-related anorgasmy. So Med J 1989; 82(7):933-34.
4. **George MS**, Brewerton TD, Cochrane C: Trichotillomania and bulimia. N Engl J Med 1990; 322(7):470-471.
5. **George MS**, Pickett JB, Kohli H, Allison MA, Pritchard P: Paroxysmal Dystonic Reflex Choreoathetosis after minor closed head injury. The Lancet 1990; 336:1134-1135.
6. **George MS**, Kellner CH, Scott T, Malcolm R: Septum Pellucidum in schizophrenia (reply). J Neuropsychiatry Clin Neurosci 1990; 2(4):462.
7. Kellner CH, Burns C, Bernstein C, Monroe R, **George MS**: Safe administration of ECT in a patient with a calcified frontal mass. J Neuropsychiatry Clin Neurosci 1991; 3(3):353-354.
8. **George MS**, Post RM, Ketter T, Marengall L, Pazzaglia P: Alpidem as an antidepressant: clarification. J Clin Psychiatry, 1992; 53(2):68.
9. Kellner CH, **George MS**, Burns C, Bernstein H, Rubey R, Custer J, Brewerton T: Human equivalent of canine acral lick. The Lancet 1992; 339:553.
10. **George MS**, Trimble MR: Dystonia associated with fluvoxamine. J Clin Psychopharm 1993; 13:220-221.
11. **George MS**, Trimble MR: A fluvoxamine-induced frontal lobe syndrome in an obsessive compulsive patient. J Clin Psychiatry 1992; 53(10):379.
12. Brewerton TD, **George MS**, Harden RN: Migraine and the eating disorders. Psychiatry Res 1993; 46;201-202.
13. Ketter TA, Andreason PJ, **George MS**, Lee C, Gill DS, Parekh PI, Willis MW, Herscovitch P, Post RM: Reply to Sarvay SM re: Procaine and Anterior Paralimbic CBF changes. Archives of General Psychiatry 1997:54, 8:764-765.
14. **George MS**, Wassermann EM, Williams WE, Kimbrell TA, Little JT, Hallett M, Post RM: Reply to re: Mood Improvements Following Daily Left Prefrontal Repetitive Transcranial Magnetic Stimulation in Patients with Depression. American Journal of Psychiatry 1999: 156,4: 669-670.
15. Anton R, **George MS**, Myrick H, Drobes D: Reply to re: Activation of Prefrontal Cortex and Anterior Thalamus in Alcoholic Subjects on Exposure to Alcohol-Specific Cues. Archives of General Psychiatry 2001.
16. Kimbrell TA, Ketter TA, **George MS,** Little JT, Benson BE, Willis MW, Herscovitch P, Post RM: Reply to 'Regional cerebral glucose utilization in patients with a range of severities of unipolar depression. Biol Psychiatry 2002; 51 (3): 237-52.
17. **George MS,** Rush AJ: Reply to 'VNS acute and chronic studies in depression.' Biol Psychiatry 2006; 58(5):364-73.
18. Bodenlos JS, Borckardt JJ, **George MS**. Vagus nerve stimulation and food cravings: A response to Gibson and Mohiyeddini. Appetite. Jul 2008;51(1):226-228.
19. O'Reardon JP, Solvason HB, Janicak PG, Sampson S, Isenberg KE, Nahas Z, McDonald WM, Avery D, Fitzgerald PB, Loo C, Demitrack MA, **George MS**, Sackeim HA. Reply regarding "efficacy and safety of transcranial magnetic stimulation in the acute treatment of major depression: a multisite randomized controlled trial". Biol Psychiatry. 2010 Jan 15;67(2):e15-7. Epub

Articles:

1987

1. **George MS**, Taylor R, Seay AR, Hogan EL: Sydenham's Chorea: A disease on the increase? J South Carolina Med Assoc 1987;83:523-527.

1989

2. **George MS**, Kellner CH, Fossey M: Obsessive-compulsive disorder in a patient with MS. J Nerv Ment Dis 1989;177:304-5.
3. **George MS**, Scott T, Kellner CK, Malcolm R: Abnormalities of the septum pellucidum in schizophrenia: Two case reports and a discussion. J Neuropsychiatry Clin Neurosci 1989;1:385-390.
4. **George MS**, Lydiard RB: Case report: Inability to walk as a symptom of panic disorder. Neuropsychiatry, Neuropsychol Behav Neurol 1989;2(3):219-223.

1990

5. **George MS**: Doing a combined residency. JAMA 1990;263:1628.
6. **George MS**, Mcleod-Bryant S, Lydiard RB, Kurent JE, Zealberg J: Panic attacks and agoraphobia associated with a giant right cerebral arteriovenous malformation. Neuropsychiatry, Neuropsychol Behav Neurol 1990;3(3):206-212.
7. **George MS**, Gross JA, Hogan EL, Kurent J, Plyler J, Perot PL: Establishing brain death in South Carolina: A clinician's guide. J South Carolina Med Assoc 1990;86(7):385-388.
8. Brewerton TD, **George MS**: The seasonal variation of migraine. Headache 1990;30(8):511-513.

1991

9. **George MS**: Establishing brain death: The potential role of nuclear medicine in the search for a reliable confirmatory test. Eur J Nuclear Med 1991;18:75-77.
10. Ring HA, **George MS**, Costa DC, Ell PJ: The use of neuropsychiatric activation procedures with single photon emission tomography: a review. Eur J Nuclear Med 1991;18:133-141.
11. **George MS**: Obsessive Compulsive Disorder. Int Clin Psychopharmacol 1991;6:57S-68S.
12. **George MS**, Lydiard RB: Speed of onset of action of the newer antidepressants: fluoxetine and buproprion. Int Clin Psychopharmacol, 1991, 6:209-217.

1992

13. **George MS**, Melvin JA, Kellner CH: Obsessive-compulsive symptoms in neurologic disease: A review. Behav Neurol 1992;5:19-30.
14. **George MS**, Trimble MR: The changing 19th century view of epilepsy as reflected in the West Riding Lunatic Asylum Medical Reports, 1871-1877, vols 1-6. Neurology 1992;42:246-249.
15. **George MS**: Early theories about the etiology of cerebral palsy: William Little and Sigmund Freud. J Hist Neurosci 1992;1:29-37.
16. **George MS**, Ballenger JC: The neuroanatomy of panic disorder: The role of the right parahippocampal region. J Anxiety Disord, 1992;6:181-188.
17. **George MS**, Ring HA, Costa DC, Kouris K, Ell PJ: Demonstration of Human Motor Cortex Activity Using SPECT. J Neural Transm, 1992, 87,3:231-236.
18. **George MS**, Costa DC, Kouris K, Ring HA, Ell PJ: Cerebral Blood Flow Abnormalities in Adults with Infantile Autism. J Nerv Ment Dis, 1992, 180, 7:413-417.
19. Ring HA, Trimble MR, Costa DC, **George MS**, Verhoeff P, Ell PJ: Effect of vigabatrin on striatal dopamine receptors: Evidence in humans for interactions of GABA and dopamine systems. J Neurol, Neurosurg, Psychiatry, 1992, 55:758-761.
20. **George MS**, Trimble MR, Costa DC, Robertson MM, Ell PJ: Elevated Frontal Cerebral Blood Flow in Gilles de la Tourette Syndrome (GTS): A ^{99}Tcm-HMPAO SPECT Study. Psychiatry Research - Neuroimaging, 1992, 45:143-151.

1993

21. **George MS**, Trimble MR, Ring HA, Sallee FR, Robertson MM: Obsessions in Obsessive-Compulsive Disorder (OCD) With and Without Gilles de la Tourette Syndrome (GTS). Am J Psychiatry, 1993, 150: 93-97.
22. **George MS**: A New Look at Obsessive-Compulsive Disorder and Gilles de la Tourette Syndrome. Clinical Advances in the Treatment of Psychiatric Disorders., 1993, 7:1-12.*
23. Brewerton TD, **George MS**: Is Migraine Related to the Eating Disorders? Int J Eating Disord 1993, 14:75-79.
24. Scott TF, Price TR, **George MS**, Brillman J, Rothfus W: Midline Cerebral Malformations and Schizophrenia. J Neuropsychiatry and Clinical Neurosciences 1993, 5:287-293.

25. **George MS**, Brewerton TD, Harden RN: Bulimia nervosa in outpatients with migraine. J Nervous Mental Disease 1993, 181;11:704-706.
26. **George MS**, Ketter TA, Gill D, Haxby JV, Ungerleider L, Herscovitch P, Post RM: Brain Regions Involved in Recognizing Facial Emotion or Identity: An O15 PET study. J Neuropsychiatry and Clinical Neuroscience 1993, 5;4:384-394.
27. Post RM, Ketter TA, Pazzaglia PJ, **George MS**, Marangell LB, Denicoff K: New Developments in the Use of Anticonvulsants as Mood Stabilizers.Neuropsychobiology, 1993, 27:132-137.
28. **George MS**, Ketter TA, Post RM: SPECT and PET Imaging in Mood Disorders. J Clin Psych 1993, 54[11,suppl]:6-13.
29. **George MS**, Trimble MR, Robertson MM: Fluvoxamine and Sulpiride in Comorbid Obsessive-Compulsive Disorder and Gilles de la Tourette Syndrome. Human Psychopharmacology: Clinical and Experimental 1993, 8:327-334.
30. Pazzaglia PJ, Post RM, Ketter TA, **George MS**, Marangell LB: Preliminary controlled trial of nimodipine in ultra-rapid cycling affective dysregulation. Psychiatry Research 1993, 49:257-272.

1994

31. **George MS**: Reanimating the Face: Early Writings by Duchenne and Darwin on the Neurology of Facial Emotion Expression. J Hist Neurosciences 1994, 2:21-33.
32. **George MS**, Rosenstein D, Rubinow DR, Kling MA, Post RM: CSF magnesium in affective illness: lack of correlation with clinical course or treatment. Psychiatry Research 1994, 51: 139-146.
33. **George MS**, Kellner CH, Bernstein H, Goust JM: A Magnetic Resonance Imaging Investigation into Mood Disorders in Multiple Sclerosis: A Pilot Study. The Journal of Nervous and Mental Disease 1994, 182, 7: 410-412.
34. **George MS**, Guidotti A, Rubinow D, Pan B, Mikalauskas K, Post RM: CSF Neuroactive Steroids in Affective Disorders: pregnenolone, progesterone and DBI. Biological Psychiatry 1994, 35: 775-780.
35. **George MS**, Ketter TA, Parekh PI, Rosinsky N, Ring H, Casey BJ, Trimble MR, Horwitz B, Herscovitch P, Post RM: Regional Brain Activity When Selecting a Response Despite Interference: An $H_2{}^{15}O$ PET study of the Stroop and an Emotional Stroop. Human Brain Mapping 1994, 1:194-209.
36. **George MS**, Ketter TA, Parekh P, Gill DS, Huggins T, Marangell L, Pazzaglia PJ, Post RM: Spatial Ability in Affective Illness: Differences in Regional Brain Activation During a Spatial Matching Task ($H_2{}^{15}O$ PET). Neuropsychiatry, Neuropsychology and Behavioral Neurology 1994, 7: 143-153.
37. Marangell L, **George MS**, Bissette G, Pazzaglia PJ, Huggins T, Post RM: Increased CSF thyrotropin-releasing hormone in affective disorder patients treated with carbamazepine. Arch Gen Psych 1994, 51: 625-628.
38. **George MS**, Lydiard RB: Social Phobia Secondary to Physical Disability: A review of benign essential tremor and stuttering. Psychosomatics 1994, 35:520-523.
39. **George MS**, Ketter TA, Post RM: Prefrontal Cortex Dysfunction in Clinical Depression. Depression 1994, 2:59-72.
40. **George MS**, Wassermann E: Rapid-rate Transcranial Magnetic Stimulation (rTMS) and ECT (editorial). Convulsive Therapy 1994, 10(4): 251-253.
41. **George MS**: An Introduction to the Emerging Neuroanatomy of Depression. Psychiatric Annals 1994, 24,12: 635-636.
42. Ketter TA, **George MS**, Ring HA, Pazzaglia PJ, Marangell L, Kimbrell TA, Post RM: Primary Mood Disorders: Structural and Resting Functional Studies. Psychiatric Annals 1994, 24, 12: 637-642.
43. **George MS**, Ketter TA, Post RM: Activation Studies in Mood Disorders. Psychiatric Annals 1994, 24,12: 648-652.
44. **George MS**, Robertson MM, Costa DC, Ell PJ, Trimble MR, Pilowsky L, Verhoeff NPLG: Dopamine Receptor Availability in Tourette's Syndrome. Psych Res - Neuroimaging 1994,55:193-203.

1995

45. **George MS**, Ketter TA, Parekh PI, Horwitz B, Herscovitch P, Post RM: Regional Brain Activity During Transient Self-induced Sadness or Happiness in Healthy Women. American Journal of Psychiatry 1995,152: 341-351.
46. Parekh P, Spencer J, **George MS**, Gill D, Ketter TA, Horwitz, B, Andreason P, Herscovitch P, Post RM: Procaine-Induced Increases in Limbic rCBF Correlate Positively with Increases in Occipital and Temporal EEG Fast Activity. Brain Topography 1995,7:209-216.
47. **George MS**, Malloy L, Slate SO, Uhde TW: A Pilot MRI Study of Brain Size in Nervous Pointer Dogs. Anxiety, 1995, 1: 129-133.
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Books:

Written:

George MS, Ring HA, Costa DC, Ell PJ, Kouris K, Jarritt P: Neuroactivation and Neuroimaging with SPET. London: Springer-Verlag, 1991.

Higgins E, **George MS:** The Neuroscience of Clinical Psychiatry: the pathophysiology of behavior and mental illness. Baltimore: Lippicott LW, 2007

Higgins E, **George MS:** Brain Stimulation Therapies for Clinicians. American Psychiatric Press, Inc, 2008.

Trimble MR, **George MS**: Biological Psychiatry, 3rd Edition. Wiley Press, 2010.

Edited:

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JA den Boer, GJ ter Horst, **MS George** (eds): Current and Future Developments in Psychopharmacology.
Elsevier Press, Inc. 2003

Stein DJ, Schatzberg A, Kupfer D (eds): Textbook of Mood Disorders. American Psychiatric Press, Inc, 2004. **George MS** Section Editor of 'Somatic Treatments'.

George MS, Belmaker RH (eds.): Transcranial Magnetic Stimulation in Clinical Psychiatry. American Psychiatric Press, Inc, 2007

Selected Abstracts for National and International Presentations:
(stopped active updating after 2002 (>300), not listing due to length, available on request)

GRANT FUNDING:

FUNDED GRANTS (Past)

MUSC and UK Fellowship -Ciba-Geigy Grant, $5,000; Solvay-Duphar Grant $1,000; MUSC Resident Grant $2,000.

NIMH Intramural Grant Funding - 4 years of full-time support within the NIMH, DIRP, Bethesda, MD. Principal investigator on numerous projects involving mood disorders and emotion regulation using cerebrospinal fluid, brain imaging and transcranial magnetic stimulation.

Co-investigator (5% - 5,000/year) - Pergolide in Children with Tourette's Syndrome, F.R. Sallee PI. $428,336/ 3 years. Funded through the FDA, Orphan Drug Grant. Funded to begin 7/95.

Co-investigator - Limbic Sensitivity in Cocaine Addiction, Bryon Adinoff, PI. $274,738, R21 National Institute on Drug Abuse (NIDA) Funding began 11/95.

Co-investigator - Phase II, Eight-week, Double-blind, Placebo-controlled Pilot Study Evaluating the Toleration, Safety and Efficacy of Oral Ziprasidone (Cp-88,059-1) in Children and Adolescents with Tourette's Syndrome. Pfizer Pharmaceuticals. Floyd R. Sallee, PI. Start Date 5/96.

Principal Investigator - MR Spectroscopy measurements of NAA and MI in Probable Alzheimer's Disease Patients Before and After Treatment with Milameline or Placebo. Small Grant ($24,000) Parke-Davis.

Consultant - The Patrick and Catherine Weldon Donaghue Medical Research Foundation - Connecticut, - Dennis Charney,MD and Nash Boutros, MD co-principal investigators. Transcranial Magnetic Stimulation and Treatment
of Depression.

Co-investigator - Parke-Davis protocol #979-15 A 52 week, randomized, double-blind, placebo-controlled, multicenter study of milameline in patients with probable Alzheimer's disease with extended open label treatment. J. Mintzer, MD MUSC PI. Start 7/96.

Principal Investigator - ($60,000 over two years) - A Dose Finding Study of Left Prefrontal Rapid Transcranial Magnetic Stimulation (rTMS) to Treat Depression', 1996 NARSAD Young Investigator Award. Start Date 6/96.

Principal Investigator (10% salary for 2 years) Serial fMRI Perfusion Scans in Rapid-cycling Bipolar Affective Disorder Subjects: A pilot study using a novel non-invasive tool to longitudinally examine regional brain activity changes as a function of mood and disease progression. ($150,000 over two years).Stanley Foundation 1996 Research Awards. Start Date 7/96.

Principal Investigator - Neurolite SPECT Imaging of rCBF as a Predictor of Response to Antidepressant Activity (Transcranial Magnetic Stimulation). ($60,000 of radiotracer) Dupont Pharma. CG #96028 1997-99.

Principal Investigator (M. George) Neotonus : A Multi-Site Clinical Trial of rTMS in the Treatment of Unipolar Depression 4/98-4/99 5% Effort $80,000

Principal Investigator - Fast MRI Brain Scanning in Alcoholism, $25,000/year x 4 years - $75,000, part of a $1.7 million NIAAA Center Grant, James C. Ballenger, PI, Raymond F. Anton, and Carrie Randall, Coordinators. 2/95 - 2/99.

Principal Investigator - Volumetric and functional MRI scanning in schizophrenia patients before and after treatment with risperidone. Janssen Pharmaceutica. ($58,750) 8/96 - 8/99.

Principal investigator - Volumetric and Functional (Perfusion) MRI scanning in schizophrenia patients before, during and after treatment with Olanzepine:Using Imaging to Document Speed of Response. Eli Lilly $46,000 direct costs (Funded 4/97).

Principal Investigator (M George, PI) NARSAD Independent Investigator Award. Combining TMS with Echoplanar BOLD fMRI to Determine Optimum Treatment Parameters for Depression. 9/89-9/00. $100,000.

Co-investigator - NARSAD (M. Beale, PI) rTMS Following a Single ECT: Antidepressant and Cognitive Effects 6/98 - 5/00 5% Effort $60,000.

Co-investigator - MUSC Foundation for Research Development - IDEAS Grant (D. Bohning, PI) Phased-Solenoid Array Coil for Deep Focused Transcranial Stimulation. 1997-78 - $30,000.

Principal Investigator - Prefrontal Transcranial Magnetic Stimulation for the Treatment of Depression in Bipolar Affective Disorder: A Pilot Study of Acute Efficacy and Preventive Maintenance. ($150,000 over two years).Stanley Foundation 1998 Research Awards. Start Date 10/98.

Co-investigator (Mark Hamner, PI) VA Merit Neuroimaging in PTSD: Using IV Procaine and SPECT to Investigate Limbic Function 7/98 - 7/00 10% Effort $120, 000 annual

Co-investigator - Non-neuroleptic treatments of childhood Tourette's Syndrome. F.R. Sallee, PI. NIMH RO1 (10% salary over 5 years). (Funded 3/97). $1,385,000 over 5 years.

Co-investigator - RO1 DA11434-01A1 Limbic Sensitivity in Cocaine Addiction Bryon Adinoff, MD PI. NIDA, Funded 2/6/97 3 years $250,000/year. 20% effort. (M. George PI of Subcontract - 11,000/year).

Principal Investigator -Using Interleaved Transcranial Magnetic Stimulation (TMS) BOLD fMRI to measure cortical excitability and MRS glutamate over motor and prefrontal cortex in normal volunteers before and during treatment with lamotrigine. Glaxo/SmithKline - $146,000 (5/01-10/03).

Principal Investigator - Defense Related Applications of Transcranial Magnetic Stimulation (TMS): Current Knowledge and a Focused, Applied Pilot Study – Defense Advanced Research Projects Agency (DARPA) - $300,000 (6/01 – 6/02).

Principal Investigator (M. George, PI) Cyberonics, Inc. DO1 - A Study of Vagus Nerve Stimulation in Patients with Depression: A Pilot and Efficacy Study 5/98-5/99 10% Effort $240,000

Principal Investigator - The Functional Neuroanatomy of Borderline Pesonality Disorder: integrated fMRI and TMS studies testing dysfunctional circuits and developing a new treatment ($450,000 over 3 years). Swiss Foundation for Research in Personality Disorders. 1/00-1/03.

Co-Principal Investigator (With DE Bohning, PhD) - Vagal Nerve Stimulation Synchronized fMRI - VNS/fMRI (Cyberonics), $100,000 over one year (3/00-3/01).

Co-Principal Investigator (With DEB),Vagal Nerve Stimulation Synchronized fMRI - VNS/fMRI (Charles A. Dana Foundation for the Neurosciences). $100,000 total (2 years).

Co-investigator - Using Left Prefrontal TMS to Treat Schizophrenia Patients with Comorbid Major Depression. (Z. Nahas PI). Neotonus. Start 1/00 - $60,000 over two years.

Co-Principal investigator - Volumetric and functional MRI scanning in depression,social phobia and obsessive-compulsive disorder before and after treatment with fluvoxamine. Solvay-Duphar, $20,000 (Funded 4/97).

Co-Investigator - Methodology for Interleaved TMS and fMRI. Daryl E. Bohning, PhD, PI. NIMH R21. $212,681 Direct Costs over 3 years. Start 6/99. 5% effort.

Consultant - Swiss National Scientific Research Grants - T. Schlaepfer, MD, PI. Effect of Rapid Transcranial Magnetic Stimulation on Refractory Major Depression. Submitted 9/95, funding to begin 6/96. 7 years duration.

Principal Investigator - Phase 1: An Initial Efficacy Test and Determination of the Optimum Dose of a New AMPAkine Compound, CX516, on Measures of Sleepiness and Performance in Sleep-Deprived Adult Volunteers. Phase II: A Test for Replication, Coupled with BOLD fMRI to Determine the Regional Brain Activity Changes that CX516 Produces While Improving Sleep-Deprived Performance . Defense Advanced Research Projects Agency (DARPA) - $275,000 over 1 year (start 4/03).

Principal Investigator – Creating a Man-Portable TMS System to Improve War-fighter Performance. Defense Advanced Research Projects Agency (DARPA) - $6,700,000 over 5 years. (Start 6/02).

Principal Investigator - NIH, NINDS, RO1- AG40956 Mood Effects of Deep Brain Stimulation in Parkinson's Disease: A Combined DBS and MRI Study. $1,441,050 over three years. 10% Effort (Funding starts 12/00).

Co-Investigator - Using fMRI to Develop New Treatments for Alcoholism, $100,000/year x 4 years, part of a $1.7 million/year NIAAA Center Grant Renewal, James C. Ballenger, PI, Raymond F. Anton, and Carrie Randall, Coordinators. 1/01-1/04.

Mentor - Jeff Lorberbaum, MD - VA National Award for Research Training in PTSD (Start 6/00, three years).

Co-investigator - Functional Imaging of the Human Brain in Health and Disease: Clinical and Research Applications. Academic Equipment Grant, Sun Microsystems. D.J. Vincent, PI. $155,700 (Start 5/01).

Co-investigator/mentor - An fMRI Study of Healthy Mothers Hearing Infant Cries. - J Lorberbaum, PI. R01, NIH, $459,632 over 3 years. 5%Effort. (Start 10/00).

PI: M. George, Apr., 2004 – Sept.,2005, Stanley Medical Research Institute, 30% effort, $280,000, "A Pilot Proof of Concept Study Assessing the Effects of DAR-0100 on Regional Brain Activity (Blood Flow and Task-Specific Activation) in Patients with Schizophrenia", Goal: To test the effects of DAR-0100, as compared to placebo, on measures of resting blood flow in the prefrontal cortex of patients with schizophrenia.

Principal Investigator - A Long-Term, Prospective, Multicenter Study to Compare the Clinical, Quality of Life, Health Care Utilization and Productivity Outcomes of the NeuroCybernetic Prosthesis (NCP®) System to Standard-of-Care Treatment in Patients with Depression. Cyberonics, Inc.- $52,000 (Start 1/01).

Principal Investigator - A Multicenter, Pivotal, Safety and Efficacy Study of Vagal Nerve Stimulation Delivered by the NeuroCybernetic Prosthesis (NCP®) System in Patients with Treatment Resistant Depression (Cyberonics, inc). $407, 000 over three years (Start 8/00).

Principal Investigator - A Safety and Efficacy Multi-site Study of Vagus Nerve Stimulation (VNS™) using the NeuroCybernetic Prosthesis (NCP®) System in Patients with Refractory Anxiety Disorders ($300,000 over three years)(start 11/00).

Co-Principal Investigator – (With Prof. Gordon Baylis, USC, Columbia), Using Functional Magnetic Resonance Imaging (MRI) and Evoked Potentials (EP) to Understand Dysfunctional Attentional Networks in Young Adults with Attention Deficit Disorder. (MUSC, $50,000/year over three years. Sponsor: SC Research Collaboration (Start 6/02).

Co-Investigator - (Z Nahas, PI) Prefrontal rTMS For Negative Symptoms Of Schizophrenia ($350,000 over three years: NIMH) start 1/03.

Co-I: M.George, Jan., 2004–Dec., 2005, Ely Lilly & Co, 5% Effort, $149,000,"Efficacy and Safety of Olanzapine in Patients with Borderline Personality Disorder: A Randomized Double-Blind Comparison with Placebo", Goal: To assess the efficacy of olanzapine therapy as compared with placebo in patients with Borderline Personality Disorder.

Co-investigator – (D. Roberts, PI) Human Cerebral Cortex Plasticity in Response to Long-Term Microgravity Exposure. NASA Space Life Sciences - $342,310 over 2 years (submitted 9/01).

Co-investigator (Nahas, PI) – A Randomized Multi-Center Study of Repetitive Transcranial Magnetic Stimulation (rTMS) in the Treatment of Refractory Depression Compared to A Sham Treatment. NeuroNetics, LLC. (230,000 over 14 months).

Consultant - Transcranial Magnetic Stimulation Treatment of Depression - David Avery, PI - R01, NIMH, $1,008,696 over three years (funded 2/00).

Mentor - Hugh Myrick, PI - Training in Functional Imaging and Alcohol Withdrawal. NIAAA (K award) starts 7/00, $695,250 over 5 years (Start 7/00).

Mentor – F. Andrew Kozel, MD - VA National Award for Research Training in PTSD (Start 6/01, three years).

Co-I (L.Key, PI).- Clinical Research Curriculum Award (CRCA) (to provide a broad-based, multidisciplinary, clinical research training program at the Medical University of South Carolina (MUSC)), NIH - $300,000.

Mentor (Kozel, PI) – Investigating the Neurocircuitry of Geriatric Depression. NIMH K23. $880,932 over 5 years (Start 6/04).

Mentor (D. Roberts, PI) – MUSC Intramural Grants - Human Cerebral Cortex Plasticity in Response to Lower Limb Immobilization (Submitted 8/01).

George (PI) 2/05-10/06
Glaxo-Smith Kline
Using Motor and Prefrontal Cortex Interleaved Transcranial Magnetic Stimulation (TMS) BOLD fMRI to Compare the Mechanism of Action of Lamotrigine to Valproic Acid in Normal Volunteers
The title explains this one, following up on earlier work.

George (PI) 2/05-2/07
US Army/Department of Defense Polygraph Institute
Functional Magnetic Resonance Imaging (fMRI) Detection of Deception
To extend prior work and test for replication using more real-world situations of jeopardy.

NASA Roberts (PI) 06/04-07/07
Human Cerebral Cortex Plasticity in Response to Lower Limb Immobilization as an Analog to Microgravity
To use TMS to measure cortical excitability changes in subjects undergoing prolonged bedrest.
Role: Co-I

NASA - EPSCOR George (PI)
06/04-07/07
Remediation of Motor Control Degradation via Application of rTMS to the motor cortex
A pilot feasibility study to determine whether one could use daily TMS to interrupt plasticity changes in subjects with leg casting.

Role: PI

FUNDED GRANTS (Current)

George, Mark S.

5 P20 DA022658-02 (See) 09/30/06 - 08/31/10 0.60 months
NIH/NIDA $146,902 Co-Investigator
Translational Research in Addiction Center - Project 2

5 R01 MH069896-04 (George) 09/15/04 - 05/31/09 1.80 months
NIH/NIMH $225,021 Principal Investigator
Optimization of TMS for Depression - Clinical Center Grant

5 R01 MH069887-04 (George) 09/29/04 - 05/31/09 2.40 months
NIH/NIMH $388,286 Principal Investigator
Optimization of TMS for Depression - Coordinating Center

1 R21 MH078046-01 (George) 7/1/2008 - 6/30/2012 0.06months
USAMRMC $285,524 Principal Investigator
The establishment of a Post-Traumatic Stress Disorder and Traumatic Brain Injury (PTSD/TBI) Clinical Consortium Study Site

1R21DA026085-01 (Brady, George) 9/1/2008 - 8/31/2012 1.20 months
NIH/NIDA $257,953 Principal Investigator
The Impact of Real-time fMRI Feedback on Response to Nicotine Cues

1R21NR010635-01A2 (Borckardt) 12/1/2009 - 11/30/2011 0.60 months
NIH/Nursing $182,500 Co -Investigator
TMS in the Management of Postoperative Pain

R01 DC009571 (Rorden) 01/01/09 Co-Investigator
NIDCD 1,250,000
A Unified Neuroanatomical Model of Speech Production and Perception: Implication for Apraxia of Speech And conduction Aphasi

R01 NS054266-01A1 (Rorden) 1.2 Months 5/01/2006-4/31/2011 Co-Investigator
NIH/CNDS $29,464
Dissociating Components of the Attentional Network in Neglect.

VA Cooperative Studies Program Grant # 556 (Yesavage) 01/06/09-01/05/1014
DOD/VA $8 Million National
Charleston PI, Exec Planning Board Member
The Effectiveness of rTMS in Depressed VA Patients

George 01/06/09-01/06/11
Brainsway, Inc $55,000 Principal Investigator
A Prospective Multicenter Double Blind Randomized Controlled Trial to Explore the Tolerability, Safety and Efficacy of the H-Coil deep Transcranial Magnetic Stimulation (TMS) in Subjects with Major Depression Disorder (MDD)

Nahas 09/13/05 - 09/12/1 0.24 months
Cyberonics, Inc. $98,400 Co-Investigator
Treatment-Resistant Depression Registry

1 T32 HD052274-01 Tilley (PI) 06/05-07/09
Biostatistical Training in Clinical Research
NIH/NICHD
Role: Faculty Steering Committee

Mentor (Nahaz, PI) – Training in Deep Brain Stimulation (DBS) and Rodent Antidepressant-Screen Models. NIMH K08. $814,431 over 5 years (Start 6/1/04).

1 R01 NS054266-01A1 Rorden (PI) 5/06-4/11
Dissociating Components of the Attentional Network in Neglect
NIH/CNDS
Role co-I (5%)

Patents and Invention Disclosures:

1) MR-Guided/MR-Compatible Pneumo-Mechanical TMS Coil Positioner TMS – with Daryl Bohning, PhD, Invention Disclosure, Filed 5/17/02. US Provisional Patent # 60/381,411.

2) System and Method of Using Synchronized Vagus Nerve Stimulation and funtional MRI to Determine the Optimum Individual Settings of VNS as Therapy. with Daryl Bohning, PhD and Ziad Nahas, MD. Filed 5/3/02. US Provisional Patent # 60/377,692

3) System and Method of Detecting Deception by fMRI. With F. A. Kozel, MD. Invention Disclosure filed 12/20/01. Provisional Patent # 60/341,137.

4) Methods and System of Using Transcranial Magnetic Stimulation to Enhance Cognitive Performance. With Daryl E. Bohning, PhD. Invention Disclosure filed 3/25/02. #19113.0093U1, provisional 60/367,520.

5) System and Method of Inhibiting the Ability to Decieve Using Functional Magnetic Resonance Imaging-guided TMS. With F.A. Kozel. Invention Disclosure filed 12/02/01. US no 10/868,045, international # PCT/US2005/020910.

6) Method and System of Using Interleaved TMS and fMRI to Assess the Regional Brain Effects of CNS active Compounds. With Daryl Bohning and Ziad Nahas. Filed 7/02.

7) Using Ampakine Compounds to Mitigate the Cognitive Deficits Caused by ECT or Other Forms of Brain Stimulation or Brain Surgery. With several others. ID Filed 8/03.

8) Systems for Using Psychophysiological Responses to Determine the Optimum VNS Dose for Individual Patients (Including a Method for Rapidly Determining TMS MT). With several others. ID filed 8/03.

Book and Chapter Reviews, published commentary:

Animal models of depression by Koob GF, Ehlers CL, Kupfer DJ (eds). Neurology 1990.

Emotions and the dual brain by Gainotti G, Caltagirone C (eds.) Neurology 1990:40,10:1640.

The triune brain in evolution: Role in paleocerebral functions, by Maclean, PD. Neuropsychiatry, Neuropsychology and Behavioral Neurology 1992:5,1:68-69.

Brainstem mechanisms of behavior by Klemm, Robert P. Vertes (eds.). Neuropsychiatry, Neuropsychology and Behavioral Neurology 1992:5,1:67-68.

Delirium: Acute confusional states by Lipowski ZJ. Neurology 1991;41:614.

Current and future trends in anticonvulsant, anxiety and stroke therapy by Meldrum BS and Williams M (eds). Neuropsychiatry, Neuropsychology and Behavioral Neurology 1992:5,1: 72-73.

Lateral Asymmetries and Hemispheric Specialization by Anke Bouma. Neurology 1991.

Foundations of the Neuron Doctrine by Gordon M. Shepherd. Neurology 1992; 42:1258-59.

Anxiety in the Elderly: Treatment and Research by Carl Salzman, Barry D. Lebowitz (eds). American Journal of Psychiatry 1993; 150:1264.

Biological Psychiatry (Vols 1 and 2) by G. Racagni, N. Brunello, T. Fukuda (eds). American Journal of Psychiatry 1993; 150:1558.

Hypnosis in the Treatment of Depressions: Strategies for Change by Michael Yapko. Neurology 1993;43:1275.

Aging and Neuropsychological Assessment by Asenath La Rue. Neurology 1993;43:1868.

Psychological Aspects of Depression by I.H. Gotlib, C.L. Hammen. American Journal of Psychiatry 1994;151:140.

Brain Activation by Per E. Roland. American Journal of Psychiatry 1994; 151:1515.

Neurobiology of Cingulate Cortex and Limbic Thalamus by B.A. Vogt, M. Gabriel (eds). Neurology 1994; 44:2425-2526.

Feminist Perspectives on Eating Disorders by P. Fallon. J Nervous and Mental Disease 1955; 183, 4: 275-276.

Seminars in Basic Neurosciences by G. Morgan, S. Butler (eds). American Journal of Psychiatry 1995; 152,4: 639-640.

The Neurology of Thinking by D. Frank Benson. Neurology 1995; 45: 1244.

Textbook of Geriatric Neuropsychiatry by C.E.Coffey, J Cummings (eds). American Journal of Psychiatry 1996; 153, 435.

"Evidence & Experience in Psychiatry" Volume 4, Chapter 5: OCD Spectrum. By Eric Hollander, M.D., Jennifer Rosen, B.S. World Psychiatric Association, 2000

Functional MRI: An Introduction to Methods. Eds Peter Jezzard, Paul N. Matthews, Stephen M. Smith, Oxford Medical Publications, 2002. Published in Radiology, 2002. ...

Current and Past Mentees and Current Academic Positions:

Trainee Last Name	Trainee First Name	Training Duration	Training Description	Degree Earned Prior to Training	Title of Project	Current Position	Source of Support
George, Mark S							
Speer	Andrew M	1995-1996	Postdoctoral Fellow	MD	Imaging of mania	Staff Scientist, NIMH, DIRP/LBC, Bethesda, MD	
Upadhyaya	Vidya	1996-2001	Postdoctoral Fellow	MD, 1996	Several fMRI of alcohol craving	Adjunct Faculty, Dept of Psychiatry, MUSC	
Li	Xingbao	2000-Present	Visiting Scientist	MD, Xiangdong Univ, China	Vagus nerve stimulation therapy	Visiting Scientist, MUSC	Chinese NSFI scholarship & visiting scientist award
Chae	Jong-Ho	2000-2002	Postdoctoral Fellow	MD/PhD, Catholic Univ, Seoul, Korea	Brain magnetic stimulation	Associate Professor, Catholic Univ, Seoul, Korea	
Myrick	Donald L. (Hugh)	2000-Present	Mentored Faculty Investigator	MD, MUSC, 1992	Functional neuroimaging of brain plasticity in dependence and withdrawal	Associate Professor, Dept of Psychiatry & Behavioral Sciences, MUSC	K Award, NIAA, K23 AA000314
Lorberbaum	Jeffery	1997-2005	Postdoctoral Fellow	MD, Stanford Univ, 1992	fMRI study of healthy mothers hearing infant cries	Faculty, Penn State Univ	NIH R01 Award
Nahas	Ziad	2000-2003	Mentored Faculty Investigator	MD, St. Joseph Univ, Lebanon, 1992	Interleaved prefrontal TMS/fMRI in schizophrenia	Associate Professor, Dept of Psychiatry, MUSC	NIH R21 Award
Kozel	Andrew Frank	6/5/99	Mentored Faculty Investigator	MD, Univ of VA School of Medicine, 1993	Neuroimaging and cognition; neurocircuitry of geriatric depression	Assistant Professor, Dept of Psychiatry, Univ of TX Southwestern, Dallas, TX	K Award pending
Halford	Jon	1995-1996	MD/PhD Student	BS	Adult epilepsy and general adult neurology	Assistant Professor, Dept of Neurology, MUSC	
Greenshields	Andrew	1998	Postdoctoral Fellow	MD, MUSC, 2000	PERFUSION MRI studies of Alzheimer's dementia patients	Resident in Radiology & Research match, MUSC	
McConnell Blumenthal	Kathleen	1997-2001	Medical Student	BS	Using TMS/fMRI to understand aging effects on brain excitability	Resident, Albert Einstein Univ; Combined program in neurology, neurosurgery and neuroradiology	AOA Grant
Najib	Arif	2002-2003	MD/PhD Student	BS, Univ of Tuebingen	Separation distress imaging study	Resident, Dept of Neurology, Univ of Tubingen, Germany	
Lomarev	Michael	2000-2004	Postdoctoral Fellow	MD/PhD, Institute of Human Brain, St. Petersburg, Russia	Functional neuroimaging	NINDS Intramural Scientist with Mark Hallett, MD- Bethesda, MD	
Tenebaek	Charlotte C.	1998-2004	Medical Student	BS	Using interleaved transcranial magnetic stimulation (TMS) BOLD fMRI to measure cortical excitability over motor and prefrontal cortex in normal volunteers before and after treatment with lamotrigine	Resident, Internal Medicine, Dartmouth College	College of Medicine funding
Yamanaka	Kaori	2001-2004	MD/PhD Student	BS	SIBS deprivation work and functional brain imaging	Clinical Psychiatry Practice, Japan	
Mu	Qiwen	2002-Present	Visiting Scientist	PhD	Neuroradiology visiting scientist NIDA Program on ph fMRI, Madison, WI	Visiting Scientist, Dept of Psychiatry & Behavioral Sciences, MUSC	
Mishory	Alexander	2002-2004	Medical Student	BS	Cognitive and sleep deprivation functional brain imaging	Faculty, Dept of Psychiatry, Beer-Sheba Univ, Israel	
Revell Peterson	Lelly J.	2000	Summer Health Professions Research Student	BS	Timings in brain activity between truth and deceptive statements as monitored through BOLD fMRI scanning	Resident, Dept of Medicine, Medical College of GA	NIH T35 DK07431
Roberts	Donna	1996-2004	Postdoctoral Fellow	MD, MUSC, 1990	Human cerebral cortex plasticity; bold fMRI and optical imaging of functional cortex in humans	Assistant Professor of Radiology, MUSC	
Yajnik	Amol	2002	Summer Health Prof Res Student	BS	Effects of transcranial magnetic stimulation on the cognitive performance of young adults	Medical Student, MUSC	Institutional Funds
Carroll	Scott J.	2002-Present	Medical Student	BS	Human cerebral cortex plasticity in response to lower limb immobilization	Medical Student, MUSC	Institutional Funds
Borckardt	Jeff J.	2003-Present	Mentored Faculty Investigator	PhD	Pain and brain stimulation	Associate Professor, Dept of Psychiatry & Behavioral Sciences, MUSC	K23 AA000314
Molnar	Christine	2003-Present	Postdoctoral Fellow	PhD	Affective processing	Postdoctoral Fellow, MUSC	
Kose	Samet	2004-Present	Postdoctoral Fellow	MD	Anxiety disorder, TMS, VNS	Postdoctoral Fellow, MUSC	
Johnson	Kevin	2003-Present	PhD Student	BS	TMS and conditioning	PhD Student, MUSC	
Ricci	Raffaella	2005-Present	Visiting Scientist	PhD	TMS and attention	Visiting Scientist, Dept of Psychiatry & Behavioral Sciences, MUSC	
Guillermas	Paulo	2004-Present	Postdoctoral Fellow	PhD	Statistical approaches to image data analysis derived from economics	Postdoctoral Fellow, MUSC	
Koola	Jejo J.	2002-Present	Medical Student	BS	TMS methods development	PhD Student, Dept of Psychiatry & Behavioral Sciences, MUSC	

Past –(Updated 3/03)

Jon Halford, MD, Medical Student MUSC 1995,6 - Duke Neurology Residency, followed by Psychiatry Residency, and now doing Neuroimaging Research. Returned to MUSC Fall 2003 as an Assistant Professor in Neurology.

Andrew M. Speer, MD – Post-Psychiatry residency research fellow, 1995,6, Senior Staff Fellow, NIMH, DIRP, Bethesda, MD

Andrew Greenshields, MD – Medical Student, MUSC (1,2) 1996 – Matched as a First Year Resident in Radiology and Research MUSC

Courtney Bloomer, - Research Assistant, 1998-9 – now Second year medical student at Jefferson Medical School, Philadelphia, PA

Lucy McGavin, MD (now Lee) – Visiting Student, 1998-9 – now predoctoral student at the University College of London, Studying with the Functional Imaging Laboratory at Queen Square.

Susan Owens, - Research Assistant, 1998-9, now University of South Florida Graduate School in Psychology, doing functional imaging research.

Kathleen McConnell, - Now Senior medical student at MUSC, initially worked in the imaging lab as a research assistant for one year 1997-8, has continued to work on summers and part-time. Several peer-reviewed papers and chapters. Recently awarded a prestigious AOA grant for fMRI work in brain tumor patients. Currently pursuing residency training at Mt. Sinai in combined neuroradiology, neurology and neurosurgery.

Vidya Upadhaya, MD – Initially worked in the lab for one year as a research assistant following medical school (1996-7). She completed her psychiatry residency and did a one year clinical research fellowship with CDAP, followed by a more intensive NIDA research fellowship. She has published several peer-reviewed papers and has won several national honors. She most recently won an APA Program for Minorities in Research Training fellowship, which provided salary support for one year. Currently in private practice of psychiatry in Charleston, SC.

Jong-Ho Chae, MD, PhD - Visiting Scholar from Seoul, Korea to BSL and CAIR – 6/00 – 1/02. Now faculty at the Catholic University of Korea, Seoul.

Arif Najib, MD - Won a prestiguous research fellowship from Tubingen, Germany as a medical student to study for one year with the CAIR. Designed a separation distress imaging study, published in the American Journal of Psychiatry. Now pursuing residency training in Germany.

Michael Lomarev, MD, PhD - Visiting Scholar from Institute of the Human Brain, St. Petersburg, Russia. Now a scientist with Dr. Mark Hallett's lab in the intramural NINDS program in Bethesda, MD.

F. Andrew Kozel, MD – 2000-2005, MUSC Psychiatry resident and Chief Resident. Research fellow in the BSL, VA Neuroscience and later NIMH K Award. Now Assistant Professor, UTSW-Dallas.

Charlotte Teneback – Initially worked in the lab for one year following undergraduate graduation (1997-8). She left for graduate school in neuroscience and then returned and decided to apply for medical school due to a need for more clinically oriented research. She has worked for the past two years with Drs. Hamner and George on a VA Merit Grant. Graduated Medical School Class at MUSC 2004. Internal Medicine Resident at Dartmouth.

Jeff Lorberbaum, MD – Began at MUSC as a Post-residency clinical research fellowship in 1997 from Stanford. Most recently won a VA Neuroscience Award and an R01. Many publications and a rising star with several recent national honors. Now Junior Faculty at Penn State University

Ziad Nahas, MD – Began here as a Post-residency clinical research felllow in 1997 from Baylor. Recent NIMH K award . He is a junior faculty in the MUSC Department of Psychiatry.

Hugh Myrick, MD – Junior Faculty in Psychiatry at MUSC. Collaborated with the imaging lab as a resident and junior faculty. K-award recipient from NIAAA in functional brain imaging and alcohol. Now Junior faculty at MUSC

Kaori Yamanaka, MD - Visting Scholar from Tokyo, Japan – 1/01-4/03. Received PhD for her work with the BSL and CAIR, primarily around DARPA sleep deprivation work and functional brain imaging.

Alexander Mishory, MD – Visiting Scholar from Israel (2002-2004). Deceased 2006.

Donna Roberts, MD – Former NASA scientist who worked with the lab as a MUSC Medical Student from 1996-1999. She has several prominent publications and won several national awards. She chose to stay at MUSC and do a Research Residency in Radiology, the first at MUSC and one of the first in the country. Radiology Resident in a special research track. Won a prestigious RSNA award for salary for 2 years of focused imaging research at MUSC (Holman Research Pathway). Completing a combined research/clinical neuroradiology residency at UCSF. NASA grant recipient. Now junior faculty at MUSC Neuroradiology Department

XingBao Li, MD – Chinese National Scholarship and Visiting Scholar from Shangdung Province, China. Arrived 6/99. Continues with the BSL and CAIR as faculty.

Chiwen Mu, MD, PhD – (2/02 to present) Visiting scientist from Bejing, China. Neuroradiologist. Has worked with NIDA program on phfMRI in Wisconsin. Currently with CAIR at MUSC, accepted for Neuroradiology position at MUSC in summer 2010.

Rafaella Ricci, PhD – Visiting Scholar, cognitive neuroscientist from Italy. Now on faculty in Torino and visiting MUSC with an international award, doing TMS/fMRI over parietal cortex to produce virtual neglect lesions.

Jeffrey Borckardt, PhD – K awardee, now on Faculty at MUSC.

Kevin Johnson, PhD, RN – Completed neuroscience PhD at MUSC, followed by RN degree. Now on post-doctoral fellowship at Stanford.

Jejo Koola, MD – MUSC medical student, worked with the lab over summers, now at UVA doing residency in internal medicine.

Invited and Named Lectures, Visiting Professorships:

May, 1998 - Pfizer Visiting Professorship Award - UC Davis

Plenary Speaker, 4th International Conference on OCD, St. Thomas, VI, Feb, 2000. "Research and Clinical Adances in Brain Stimulation Techniques".

Plenary Session, Annual Meeting of the Chinese Medical Association, Taipai, Taiwan, June, 2001: "Minimally Invasive Brain Stimulation."

Guest Speaker, Human Systems Conference 2001, Exploring the Human Frontier. The International Conference on Technologies for Human Factors and Psycho-Social Adaptation in Space and Terrestrial Applications. June, 2001, Houston, TX. "Transcranial Magnetic Stimulation as a Treatment for Depression and Potential Tool on Long-Range Missions"

12th Annual Samuel Guze Memorial Lecture, Washington Univeristy (St.Louis) Psychiatry Department, November 6, 2001

Visiting Professor, University of Groningen, Holland (July, 2001)– Department of Biological Psychiatry. Gave several lectures on gender differences in brain activity with respect to emotion, as well as lectures on TMS and VNS.

Plenary Lecture, Annual Danish Psychiatric Association Meeting, March 2, 2003.

Keynote Address, 36th Annual Meeting of the Royal Australian and New Zealand College of Psychiatrists (RANZCP), Hobart, Australia, May 17, 2003 – Title: Tickling the Brain: An overview of new technologies for treating depression.

UCLA Rosen Memorial Lecture , 2/17/06

Israel, Ber-Sheeva, Dozor Visiting Scholar, 4/3-4/10/06 – Lectures in Ber-Sheeva, Jerusalem, Tel-Aviv, Haifa.

Johns Hopkins Invited Memorial Grand Rounds – 5/2/06

University of Connecticut Staben Lecture, 10/08.

AWARDS, ACTIVITIES AND HONORS:

High School:

Eagle Scout, Newspaper co-editor, soccer and cross-country team captain, president of the high school Honor Society, treasurer of the S.C. chapter of the National Honor Society, Boys State delegate.

College:

Charles Dana and Joseph McConnell Honor Scholar
National Honor Society Scholarship Recipient
Member, Debate Team
Member, Newspaper Staff
Cum Laude graduate

Internship and Residency:

Teaching

Nominated, 1986 MUSC Golden Apple Award.
Recipient, 1987 House Officers Excellence Award.
Recipient, 1988-89 Psychiatry Golden Apple Award.
Recipient, 1989 Association For Academic Psychiatry/Mead Johnson Fellowship in Academic Psychiatry.

Administration

Neurology representative, MUSC Executive Housestaff Committee, 1988-89.
Housestaff representative, MUSC Risk Management Committee, 1988-89.
Chief Resident, Neurology, 1989-90.
Recipient, 1989-90 American Medical Association/Burroughs Wellcome Leadership Program for Resident Physicians.
S.C. Delegate, Interim Meeting, American Medical Association Resident Physician Section, Dec. 1-2, 1989.
S.C. Delegate, Annual Meeting, American Medical Association Resident Physician Section, June 23-25, 1990.

Academic

Best Poster Presentation, American Association for the Study of Headache, 31st Annual Scientific Meeting, June 16-19, 1989. "A Study of the Seasonal Variation of Migraine."
1989 - The Benjamin C. Riggs Award for Best Resident Paper.
1989 - The Upjohn Young Investigators Award.
1990 - The Benjamin C. Riggs Award for Best Resident Paper.

Fellowship Training

American College of Neuropsychopharmacology (ACNP)/Mead Johnson Travel Awardee, ACNP Annual Meeting, San Juan Puerto Rico, December, 1992
NIMH Award for Excellence in Clinical Care and Research, 1993
American Neuropsychiatric Association Young Investigator Award, 1995

MUSC Faculty - Awards

1996	NARSAD Young Investigator Award
1997	Southern Association for Research in Psychiatry Outstanding Young Investigator
1998	Pfizer Visiting Professorship Award - UC Davis
1998	NARSAD Independent Investigator Award
1998	Finalist, Glasgow College International Neuropsychopharmacology (CINP) Young Scientist Award

2000	Member, SC Alpha Chapter of Alpha Omega Alpha (AOA), the National Honor Medical Society
	Circle of Excellence Award for Outstanding Teaching in the Doctoring Curriculum I Course
	Honorable Mention, NARSAD Gerald Klerman Award for Clinical Research
2003	Circle of Excellence Award for Outstanding Teaching in the Doctoring Curriculum I Course
2005	Elected 'Best Doctors in America'
2007	Lifetime Achievement Award, World Federation of Societies of Biological Psychiatry (WFSBP)
2008	NARSAD Falcone Award for Outstanding Research in Mood Disorders
2009	US News and World Report – '14 Pioneers on the Cutting Edge'
	SC Business Journal – Health Care Hero

MUSC Faculty - Committees

1999-2000	Member, Ad Hoc Committee to Integrate Research with the New MUH Hospital 'Authority Status'
1997-2000	Member, MUSC Institutional Review Board (IRB)
1997-2000	Member, Ad Hoc Task Force on Feasibility of PET Imaging at MUSC
1997-1998	Member, Search Committee for Neurology Chairman
1999-2001	MUSC College of Medicine Faculty Senate
1996-2001	Member, Undergraduate Medical School Curriculum Committee
2000-2001	Member, Neuroscience Course Curriculum Change Committee--
2001-2002	Chairman, MUSC Psychiatry Grand Rounds Committee
2001-2002	Member, Radiology Department Chairman Search Committee
2000-2002	Member, MUSC Pychiatry Department Management Team
2000-2005	Faculty Advisor, Joint Neurology and Psychiatry Residency

1998-present	Member, MUSC Institutional Review Board (IRB) 1
2001-present	Director, Specialty Division, MUSC Psychiatry
2005 – present	Chairman, Neurosciences Department Search Committee for Neuroimaging Faculty
2005-present	Co-Chairman, USC BICOE Endowed Chairs Search Committee

HOBBIES:

Sailing, windsurfing, hiking, golf, canoeing, gardening.

MEMBERSHIPS, CIVIC ORGANIZATIONS:

Sierra Club
The National Wildlife Federation
The Nature Conservancy
Sunrise Presbyterian Church
Participant, Renaissance Weekend, 1997, 1998, 1999
Room Father, Soccer Coach